MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/16

EEE3106 – PROCESSING AND FABRICATION TECHNOLOGY

(EE)

09 MARCH 2016
2:30 P.M- 4:30 P.M.
(2 Hours)

INSTRUCTION TO STUDENTS

1. This Question paper consists of 4 pages with 3 Questions only.
2. Answer **ALL** questions. The distribution of the marks for each question is given.
3. Please print all your answers in the Answer Booklet provided.

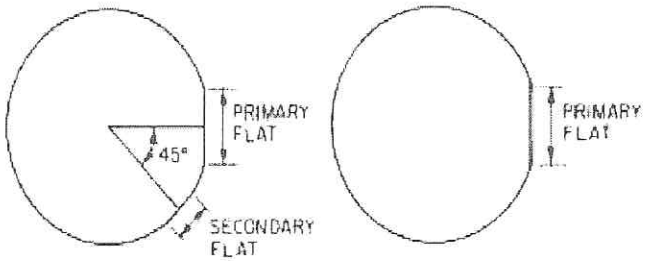
Question 1

(a) Ingot is the product of a crystal growing process, where it must then go through processes such as diameter grinding and crystal orientation. Discuss the importance and procedure for diameter grinding and crystal orientation check. check.

[8 marks]

(b) Discuss flat grinding and its importance. Determine the crystal orientation and the type of conductivity of the wafer as shown in Figure 1b(i) and Figure 1b(ii), respectively.

[4+4=8 marks]



(i) (ii)

Figure 1b

(c) Apply the knowledge of Hot Point Probe to determine the conductivity type of a semiconductor with the aid of suitable diagram.

[1+3=4 marks]

Question 2

(a) Photolithography is a method to transfer a pattern to the wafer surface by exposing high intensity ultraviolet light to the photoresist through a photo-mask.

(i) Discuss a method used to apply photoresist on the surface of wafer.

[4 marks]

(ii) Explain how the thickness of photoresist can be controlled.

[2 marks]

(iii) Calculate the thickness of photoresist if the spinner constant is 80, resist solid content is 12 % and spinning speed is 3000 rpm.

[3 marks]

(iv) If the spin-coated photoresist in (a)(iii) is found too thin, explain THREE possible reasons that lead to the thin photoresist and provide solutions to overcome them.

[4 marks]

Continued.....

(b) Differentiate between parametric test and functional test used in device packaging process.

[4 marks]

(c) Justify why ultrasonic bonding is useful for aluminium wire bonding and discuss how aluminium wire bonding can be achieved using this method. [2+6=8 marks]

(d) Mask alignment and exposure are important steps for Complementary Metal Oxide Semiconductor (CMOS) Integrated Circuit (IC) fabrication

(i) Discuss contact printing photolithography including the induced problems. [6 marks]

(ii) Discuss proximity printing including its advantages and disadvantages. [5 marks]

(e) Consider a CMOS design requires a line pattern of 2.5 μm resolutions. The light source is of a wavelength of 390 nm, determine the gap needed for the proximity printing to achieve the required resolution. Assume that the constant $k = 1$. Illustrate the schematic form of a mask with a long slit of width, W, separated from a parallel image plane (wafer) by a gap, g.

[3+3=6 marks]

(f) Consider a CMOS design that requires a very high resolution and it is meant for mass production.

(i) Suggest the best exposure method for this application and justify your answer mentioning the advantages of using this method.

[4 marks]

(ii) If the objective lens of the exposure system can collect the light with angle $\alpha = 53.13°$ and the exposure is done in air. Determine the best resolution for this exposure system. Assume that the constant $K_1 = 0.75$ and the light source used is of wavelength of 320 nm.

[4 marks]

Continued.....

Question 3

(a) Describe the problems encountered during thermocompression bonding .

[8 marks]

(b) Describe the process of packaging. .

[4 marks]

(c) Explain the procedure for flip-chip bonding.

[6 marks]

(d) Explain the procedures for Tape-automated bonding after making gold bump on aluminium (Al) bonding pads. .

[12 marks]

End of Paper